Implementation of Belbin's model for the creation of teams in project based courses

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***Abstract**: This paper presents an experiment conducted with Chemical Engineering Students at RMIT University that demonstrates the utility of forming teams based on Belbin's Team Roles Theory.*

According to Belbin (2008), a team is more effective when it has a combination of members who think, perform tasks, and are good in dealing with people. The first approach to team formation was to conduct the Belbin's Self Perception Inventory (SPI) for all the students enrolled in the project based course PROC2091 – Process Systems Integration - delivered in the final year of the program. The SPI is an assessment used to gain insight into an individual's behavioural tendency in a team environment. With this information, teams were created looking for a blend of thinkers, task performers and communicators in each team. An evaluation conducted at the end of the semester demonstrated that indeed Belbin's roles provided useful information for improving team performance and individual satisfaction within the groups.

Introduction

The Belbin team inventory method has been used in many organizations and is based in the theory of Team Roles. This theory is in fact an assessment used to gain insight into an individual's behavioural tendency in a team environment. A team member can be creative or imaginative; another can show good communication or leadership skills. It is also very common that an individual may exhibit strong tendencies towards multiple roles.

Project based courses require the creation of teams assigned to specific projects, in which academic performance, communication skills and team effort are equally important. So far, important individual attributes such as knowledge and technical skills, creativity, enthusiasm, communication skills, motivation, self-discipline, leadership, etc have been partially ignored just because teams have been randomly organized. It was then decided to have a more scientific approach to team formation with the support of the team-role theory developed by Meredith Belbin (2008).

Team building in project based courses

The process of creating an effective team is called team building. Francis and Young (1992) conclude that team building involves the working through of all blockages to progress until a work group becomes an effective team. Clearing those blockages constitutes the most important tool in the approach to team building. If a particular blockage is not cleared immediately, the team regresses.

Project based courses (PBC) allow creating tasks whose degree of difficulty and openness simulate a problem solving approach similar to the real world. Because of this nature, students initially show a high level of enthusiasm towards PBC. They also know that need to work more cooperatively with peers and mentors in a student-centered environment. But the team building process is not without conflict. So far, teams have been organised using a random approach. Once informed, most of the students expressed a high degree of dissatisfaction mainly because these new teams have not built relationships. They feel insecure in an environment where individual roles are still not very clear. This incident constitutes the first blockage that needs to be solved by the course coordinator. But blockages

are not only typical of the initial team building stage. They can appear along the project as team work is an ongoing process. Hills (2001) identified four project stages associated with team formation:

Stage one: Identified by enthusiasm and motivation

Stage two: Complains start to show up. Team supervisor needs to resolve their differences

Stage three: It is the confusion stage. It requires great deal of support from the team supervisor

Stage four: It is the performance stage. Eventually, each team know what to do and how to do it. And, if they do not, they look for guidance

Due to the number of conflicts generated along the semester, it was evident that the random approach didn't assemble balanced teams whose members possessed the mix of technical skills that can handle the project and a variety of personality types. Francis and Young (1992) state that the concept of balanced team building can be analysed from two distinct but complementary perspectives: team members' technical capabilities and individual members' roles. As for the first requirement, it is obvious that the capabilities of team members must match the tasks that they are undertaking. It was assumed that all the students enrolled in PROC 2091 are technically capable at different levels of competence. The second requirement, which constitutes the central topic of this paper, was covered by conducting the Belbin's Self Perception Inventory test for all the students. Belbin (1982) studied the personalities and mental capabilities of team members and discovered that each person showed a strong tendency to play a distinct set of roles from definable categories. Belbin identified and described some fundamental team roles and after much research, he was able to predict the performance of each team by analysing the results of a set of psychometric tests conducted for each member. The winning teams were those whose membership was broad enough so that all necessary roles were filled.

Table 1: Identified team roles

Team role	Contribution	Weakness
Plant (PL)	Creative, unorthodox. Solves difficult problems.	Too preoccupied to communicate effectively.
Resource Investigator (RI)	Extrovert, enthusiastic, communicative. Explores opportunities.	Over-optimistic. Loses interest once initial enthusiasm has passed.
Co-ordinator (CO)	Mature, confident. Clarifies goals, delegates well.	Can be seen as manipulative. Offloads personal work.
Shaper (SH)	Challenging, dynamic. Likes to overcome obstacles.	Prone to provocation.
Monitor Evaluator (ME)	Strategic and discerning. Sees all options. Judges accurately.	Lacks drive and ability to inspire others.
Team worker (TW)	Co-operative, perceptive and diplomatic. Averts friction.	Indecisive in difficult situations.
Implementer (IMP)	Disciplined, reliable. Turns ideas into practical actions.	Somewhat inflexible. Slow response to new possibilities.
Completer finisher (CF)	Conscientious. Searches out errors and omissions. Delivers on time.	Reluctant to delegate.
Specialist (SP)	Dedicated, self-starting. Provides knowledge and skills.	Contributes on only a narrow front. Dwells on technicalities.

Belbin's team-role descriptions

There are currently nine team roles identified by Belbin (2008). Table 1 shows some of the most important characteristics assigned to each role. The team role theory is based on the concept of individual strengths and also weaknesses contributing to the team. A person can perform some tasks naturally and effectively, whilst performing others correctly only after applying a great deal of effort and self discipline. The success and individual satisfaction within a team depends on how those sets of completely different skills and behaviours are optimally applied.

The self perception inventory (SPI) for PROC2091 students

The Self Perception Inventory (SPI) for each of the 60 students enrolled in PROC 2091 was conducted during the first week of the semester. The SPI (Belbin 2009) is basically a questionnaire with ten sections that analyses with relative accuracy how each person approaches different team work situations such as contribution to the project, involvement with other people, characteristic approach to group work, job satisfaction, approach to difficult tasks with limited time and unfamiliar people, etc. For each section, the student was asked to distribute a total of 10 points between the sentences that he/she thinks most accurately describes a particular behaviour. The student should try to avoid both extremes of given one sentence all ten points or allocating one point to every sentence in each section. At the end of the questionary, data are processed for each student and individual reports are issued highlighting specific individual strengths and "allowable weaknesses". Figure 1 presents the characteristic approach to team work for the entire PROC 2091 class after analysing the SPI. The graph shows that most of the students tend to be co-operative, disciplined and reliable, like to turn ideas into practical actions, dedicated, self-staring. A minority shows a clear tendency for leadership, creativeness or communication skills. Probably this global behaviour is common in engineering students. With this information on hand, teams were organised before running the project.

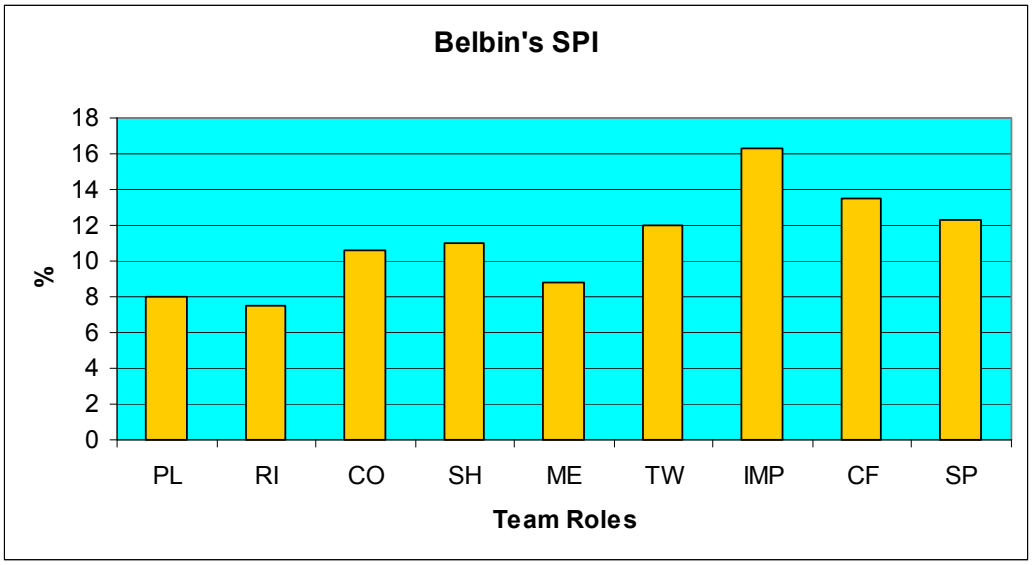

Figure 1: Team roles characteristics for students enrolled in PROC 2091

Formation of teams

It has been demonstrated that teams composed entirely of people either "creatively clever" (Plant Team Role), or "analytically clever" (Monitor Evaluator Team Role) are rarely the success that it can be expected. This theory is known as the Apollo Syndrome, name given by Dr. Belbin (2009) to very "clever teams" that score high for critical thinking ability but not always deliver excellent outcomes. According to Belbin (2009) the best structured team needs to have a blend of thinkers (PL, ME, SH), task performers (CF, IMP, SP), and communicators (CO, TW, RI). This balanced approach was followed in the process of organising 12 project teams for PROC 2091. Figure 2 shows the combinations of roles for the best possible project team.

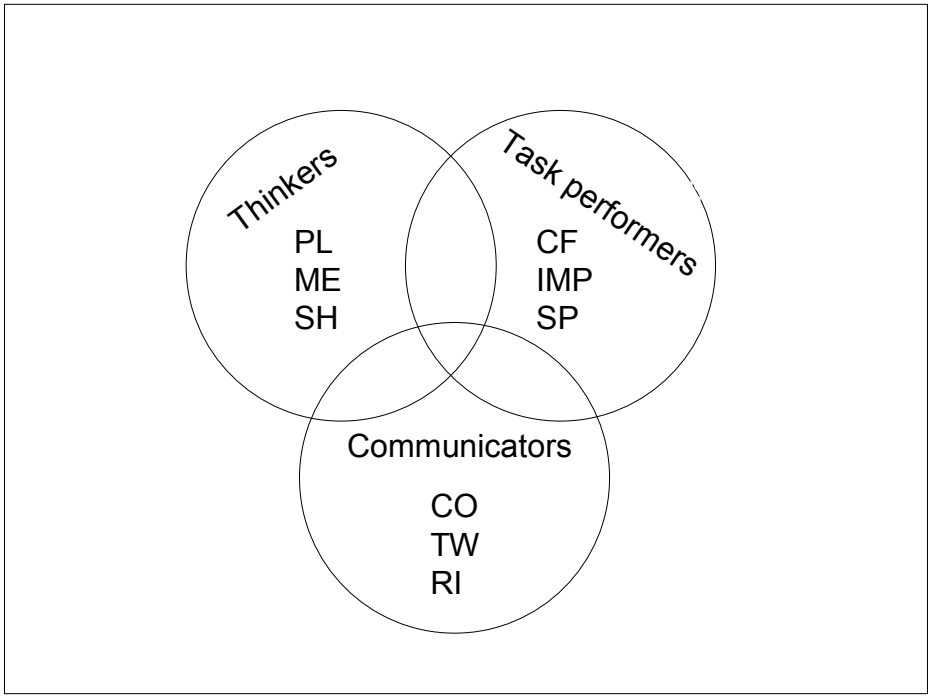

Figure 2: How to select the best project team

Feedback from students

At the end of semester students were asked to provide some feedback on how useful has been the implementation of the team inventory method to improve team performance and individual satisfaction within each team. Most of the students found the BELBIN method effective as it helped to provide a variety of different skills to the group. However, an important sector considered the method as having minimum or no impact all on team performance. Some key comments are detailed below.

Positive comments

"The BELBIN method did reduce the amount of conflict in the group, and worked well in this case, since it allowed certain people to be the leaders and others experts/workers".

"The group I was placed in certainly proved that the BELBIN method is effective in team formation. We each had our own skills that allowed focusing on specific areas of the project that could be easily understood and completed"

"I think the combination of the Belbin roles worked well and it should be encouraged next time".

"I found the BELBIN method for group allocation was beneficial for our group as we had different people with different skills that played vital roles in undertaking the project".

"Throughout the performance for the group, I think Belbin did work out quite well in terms of individual skills on this project. There were some team members good in communicating with the rest of the group. Also, there was a leader who organized and allocated tasks according to everyone's knowledge. Overall, the group work out pretty good and managed to get the report due on time".

Neutral comments

"I am still undecided on the use of the Belbin method as a tool for team formation".

"I felt neutral regarding the BELBIN method for team formation. I didn't believe there was any influence on the performance of the team or in resolving any conflict within the team".

"I think the BELBIN method is not 100% effective for team formation as some people might fake some of the attributes and weaknesses they have.

"BELBIN is an effective method to match up team members especially in the earlier years to promote networking and developing social skills. However, for high achieving students to be paired up with a group of unmotivated indolent bludgers one can begin to question the effectiveness of BELBIN".

Negative comments

"I don't think the Belbin method was really positive; we did have some difficulties finishing this project".

"I think BELBIN has potential. However, I believe in this case it did not work. I think University is a chance to build up other skills rather than continually play to your strengths. We didn't have conflicts which were possibly the result of using BELBIN".

"I do not believe the Belbin method of team formation was very useful in the case of our group. There was a distinct lack of initiative that hindered our group activities and overshadowed any benefits this method of team formation may have had".

Qualitative evaluation

Course learning outcomes were used as a qualitative tool to evaluate the benefit of applying Belbin's model on team performance. Table 2 shows a summary of learning outcomes and how they were achieved using two different approaches for team building: randomly selected teams and the self perception inventory method for team's formation (Belbin's model).

Table 2: Learning outcomes for two different approaches in team building

Learning outcome	Teams randomly selected	Belbin's model
Describe most common processes to make a specific product	Initial difficulties for literature review. Possible lack of co-ordination	Resource investigator explored opportunities and this learning outcome was completed earlier
Explain how a process is chosen as the selected process Summarise main advantages of selected process	Still some literature review difficulties. Some lack of confidence to decide which is the best process	Co-ordinator was able to overcome problems. Selected process is defined earlier
Prepare flow and instrumentation diagrams for selected process	Some teams spent too much time in preparing flow diagrams. Probably don't have the right person with the required knowledge and skills. Some other teams had the right person	A specialist with drawing skills was very advantageous here. Also the contribution of a creative person to see different options for flow diagrams was very positive
Select best equipment for selected process	Most of the teams showed difficulties in making clear decisions on selecting best process equipment	Most of the teams showed difficulties in making clear decisions on selecting best process equipment
Design process equipment	It is a critical project stage. As this course is part of an engineering program most of the teams had implementers, completer finishers and specialists. Found obstacles that sometimes were unsolved	Learning outcome reached better levels due to the presence of a co-ordinator or a dynamic person within the teams. Conflicts were less frequent
Justify process feasibility using economic analysis	No good reasoning in majority of teams	No good reasoning in majority of teams

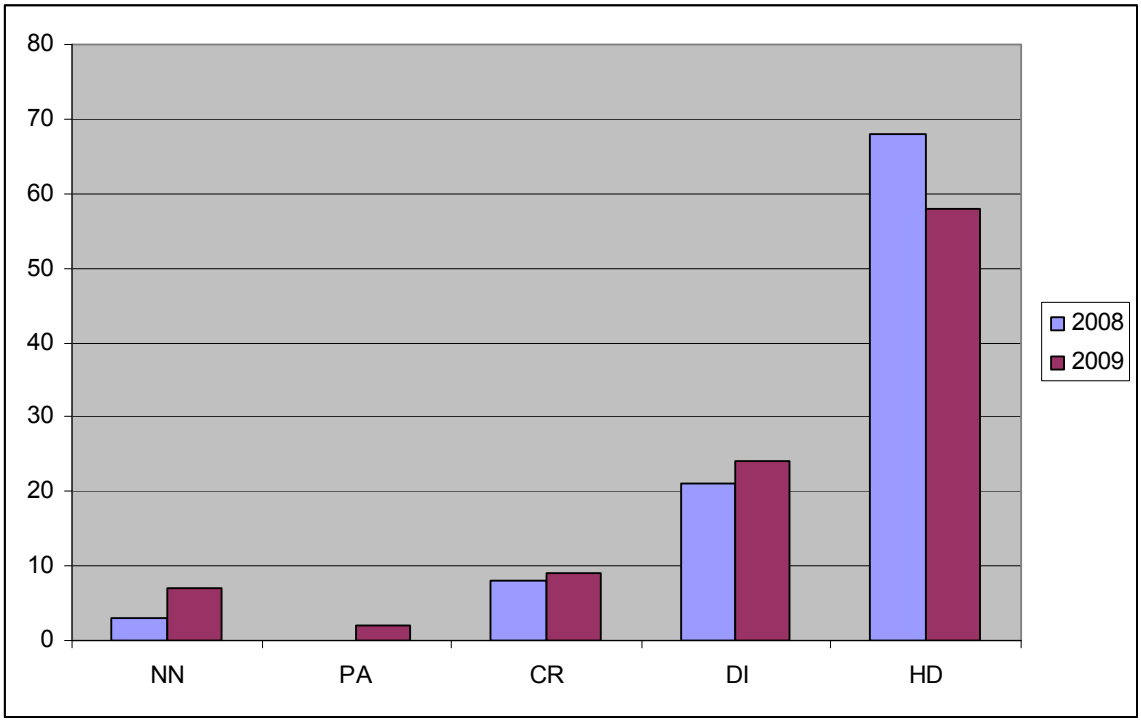

Figure 3: Marks distribution for years 2008 and 2009

Finally, Figure 3 shows that there is not improving in academic performance between year 2008, when group building was randomly selected, and year 2009 when Belbin's model was applied. However, it is important to notice that in 2009, the number of internal team conflicts was reduced and the level of individual satisfaction was generally higher.

Conclusions

The experience of using for the first time the Belbin's Team Role Theory - based on the concept of individual strengths and weaknesses contributing to the team - was positive in the sense that individual satisfaction showed improvement in relation to previous years. Academic team performance didn't show major change. Feedback provided by about 50% of the students indicated that the project run smoothly, conflicts within the groups were reduced, allowing different people with different skills to play vital roles in undertaking the project. About 30% of the students felt neutral regarding the Belbin's model for team formation. The rest, 20%, didn't believe there was any influence on the performance of the teams or in resolving any conflict within the teams. Overall, the experience was positive and encourages the use of the Belbin's method in the future. It is absolutely necessary to collect more data that could proof the benefits of using this theory in team building and team performance.

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